City voters will soon go to the polls to decide whether to support a tax increase to build a new high school. Approval of bond issues like this requires a 60% "super majority" of yes votes. A local radio station phones 148 randomly selected voters, and finds 96 in favor of building the school.

a) Discuss the assumptions and conditions required to create a confidence interval for the true proportion.

b) Create a 95% confidence interval.

c) Explain why the station said the outcome was "too close to call."

d) The local newspaper wants to conduct a poll of its own, with a margin of error only one-third as large. How many voters must the paper contact?

a) Independence: Yes

Random: Yes

10% Condition: Yes (>1480 town voters)

Success/Failure:

$np > 10 \quad nq > 10$

$(148)\left(\frac{96}{148}\right) > 10 \quad (148)\left(\frac{52}{148}\right) > 10$

$96 > 10 \quad 52 > 10$

*If any of these fail, we cannot use the Normal model (and calculate confidence intervals).

b) 95% Confidence Interval:

$\hat{p} \pm 2(SE(\hat{p}))$ $\quad \hat{p} = \frac{96}{148}$ $\quad \hat{q} = \frac{52}{148}$ $\quad n = 148$

$\frac{96}{148} \pm 2\sqrt{\frac{\left(\frac{96}{148}\right)\left(\frac{52}{148}\right)}{148}}$

0.65 ± 0.08

$(0.57, 0.72)$

c) The margin of error includes the resolution passing and not passing, so they cannot make a sound determination on what will happen.

d) $ME = 2\sqrt{\frac{\hat{p}\hat{q}}{n}}$ $\quad ME = 0.08$ $\quad \frac{1}{3}ME = 0.026$ $\quad \hat{p} = 0.64$ $\quad \hat{q} = 0.36$

$\frac{1}{3}(ME) = 2\sqrt{\frac{\hat{p}\hat{q}}{n}}$ ↑ solving for n

$\left(\frac{1}{2}\left[\frac{1}{3}(ME)\right]\right)^2 = \left(\sqrt{\frac{\hat{p}\hat{q}}{n}}\right)^2$

$\left(\frac{1}{2}\left[\frac{1}{3}(ME)\right]\right)^2 = \frac{\hat{p}\hat{q}}{n}$

$n = \frac{\hat{p}\hat{q}}{\left(\frac{1}{2}\left[\frac{1}{3}(ME)\right]\right)^2}$

$= \frac{(0.64)(0.36)}{((0.5)(0.026))^2}$

$= \frac{(0.64)(0.36)}{(0.000169)}$

$= 1363$

# of people needed in a sample to get a margin of error of 0.026

In January 2007 *Consumer Reports* published their study of bacterial contamination of chicken sold in the United States. They purchased 525 broiler chickens from various kinds of food stores in 23 states and tested them for types of bacteria that cause food-borne illnesses. Laboratory results indicated that 83% of these chickens were infected with *Campylobacter*.

a) Check the conditions for creating a confidence interval.

b) Construct a 95% confidence interval.

c) Explain what your confidence interval says about chicken sold in the United States.

The study described in the previous problem also found that 15% of the 525 broiler chickens tested were infected with *Salmonella*.

a) Are the conditions for creating a confidence interval satisfied? Explain.

b) Construct a 95% confidence interval.

c) Explain what your confidence interval says about chicken sold in the United States.